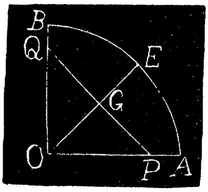
wood, 1.026 the density of the sea-water. Then $OG=\frac{4r\sqrt{2}}{3\pi}$, $OP=OQ=\frac{8r}{3\pi}$.

$\therefore$ area $POQ=\frac{32r^2}{9\pi^2}$, area quadrant$=\frac{1}{4}\pi r^2$, area



$$QBEAPQ=\tfrac{1}{4}\pi r^2-\frac{32r^2}{9\pi^2},\quad \therefore\ 1.026\left\{\tfrac{1}{4}\pi r^2-\frac{32r^2}{9\pi^2}\right\}=\tfrac{1}{4}\pi r^2\rho.$$

$$\therefore\ \rho=1.026\left(1-\frac{128}{9\pi^3}\right)=.5554.$$

This is the density of Juniper tree (dry) and very nearly the density of white pine (.554).

23. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics in Texarkana College, Texarkana, Arkansas.

Pliny says, "Thales determined the cosmical setting of the Pleiades to have happened in his time 25 days after the vernal equinox". Determine the time when Thales lived from the following data:—Latitude of Miletus 37° 30′, the precession of the equinox 50″.34 anually, the R. A. of Alcyon (η Tauris) Jan. 1, 1895, 3h. 41m. 15 sec. declination 23° 46′ 49″ N.

Solution by the PROPOSER.

Let λ=latitude of Miletus, a, δ, t, a_1, δ_1, t_1, the R. A. declination, and hour-angle of Alcyon and the Sun respectively; ε=the obliquity of the ecliptic, ω=the distance the Sun has traveled on the ecliptic after the vernal equinox.

Then $\cos t=-\tan\lambda\tan\delta\ldots.(1)$. $\cos t_1=-\tan\lambda\tan\delta_1\ldots.(2)$. $\sin a_1=\tan\delta_1\cot\varepsilon\ldots.(3)$. $a_1+t_1=a+t=\theta$, or $a_1=\theta-t_1\ldots.(4)$. $\sin a_1=\sin(\theta-t_1)\ldots.(5)$. From (3) and (5), $\sin(\theta-t_1)=\tan\delta\cot\varepsilon\ldots.(6)$. From (2) and (6), $\tan\delta_1=\frac{\sin(\theta-t_1)}{\cot\varepsilon}=-\frac{\cos t_1}{\tan\lambda}\ldots.(7)$. From (7)

$$\tan t_1=\frac{\sin\theta\tan\lambda+\cot\varepsilon}{\cos\theta\tan\lambda}\ldots.(8):$$

Also $\cot\omega=\cos\varepsilon\cot a_1\ldots.(9)$. Now $\lambda=37°\ 30'$, $\delta=23°\ 46'\ 49''$, a=3h. 41m. 15 sec., $\varepsilon=23°\ 27'\ 13''$. From (1), $t=109°\ 45'\ 43''.57$=7h. 19m. 2.9 sec. $a+t=\theta$=11h. 0m. 17.91 sec.$=165°\ 4'\ 28''.57$. From (8) $t_1=106°\ 30'\ 10''.94$ =7h. 6m. 0.73 sec. From (4), a_1=3h. 54m. 17.18 sec.$=58°\ 34'\ 17''.7$. From (9), $\omega=60°\ 43'\ 28''.47$.

In one day the Sun moves $59'\ 8''.35$. $(59'\ 8''.35)\times25=24°38'\ 28''75$. $60°\ 43'\ 28''.47-24°\ 38'\ 28''.75=36°\ 4'\ 59''.72=129899''.72$. $129899''.72\div50''.34=2580.44+$years. $2580.44-1894=686.44$ B. C., when Thales determined the cosmical setting of the Pleiades. $60o\ 43'\ 28''.47\div59'\ 8''.35=61.6085$ days after vernal equinox. $61.6085-25=36.6085$. $59'\ 8''.35\div50''.34=70.48768$ years. $79.48768\times36.6085=2580.448+$. $2580.438-1894=686.448$ B. C.

Also solved by *F. P. MATZ.*